:KLEF Piano for BBC micro:bit

www.kitronik.co.uk/5631

The :KLEF Piano is a musical instrument board, utilising the BBC micro:bit (connected via a standard card slot connector) to process capacitive touch sensor signals and output audio signals to an amplifier and speaker.

The Piano has 15 capacitive touch pads, with 13 arranged as a single octave on a piano keyboard and 2 as up/down function buttons. The capacitive touch sensor (AT42QT2160) registers changes in capacitance on the pads and sends a signal to the BBC micro:bit via the I2C protocol to tell it which pad was touched. The software on the BBC micro:bit can be configured to send specific audio signals to be played through the speaker, depending on which key is pressed. It can also be setup to provide a variety of other output options, including sending signals to other BBC micro:bit boards; whether they are physically attached to the Link header connector, or communicating over the radio.

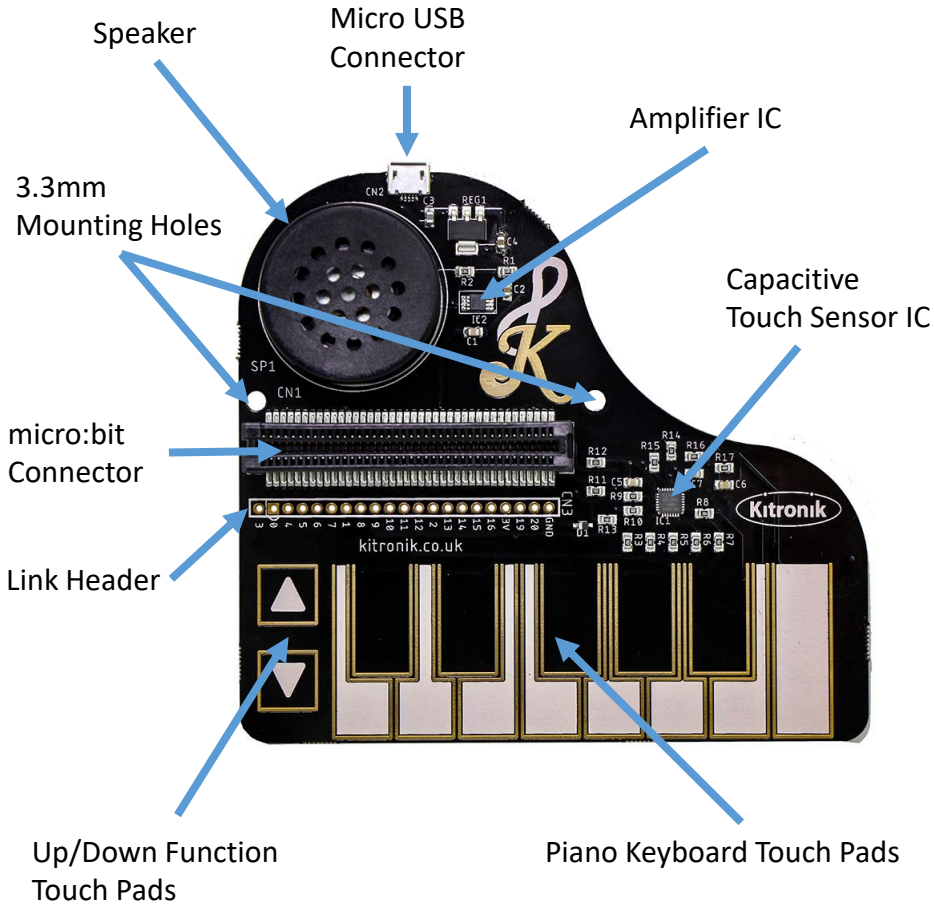
Power is provided via a 5V micro USB connector, and the board then produces a **regulated 3.3V supply** which is fed into the 3V and GND connections **to power the connected BBC micro:bit**, removing the need to power the BBC micro:bit separately. This also powers the capacitive touch sensor IC and audio amplifier.

Inserting a BBC micro:bit:

To use the Piano, the BBC micro:bit should be inserted firmly into the edge connector, either way round. If the Link header is being used, the BBC micro:bit LED display should be facing the Piano keys.

Examples: For some further ideas for what you could do with the piano, go to: http://www.kitronik.co.uk/5631

Board Layout:



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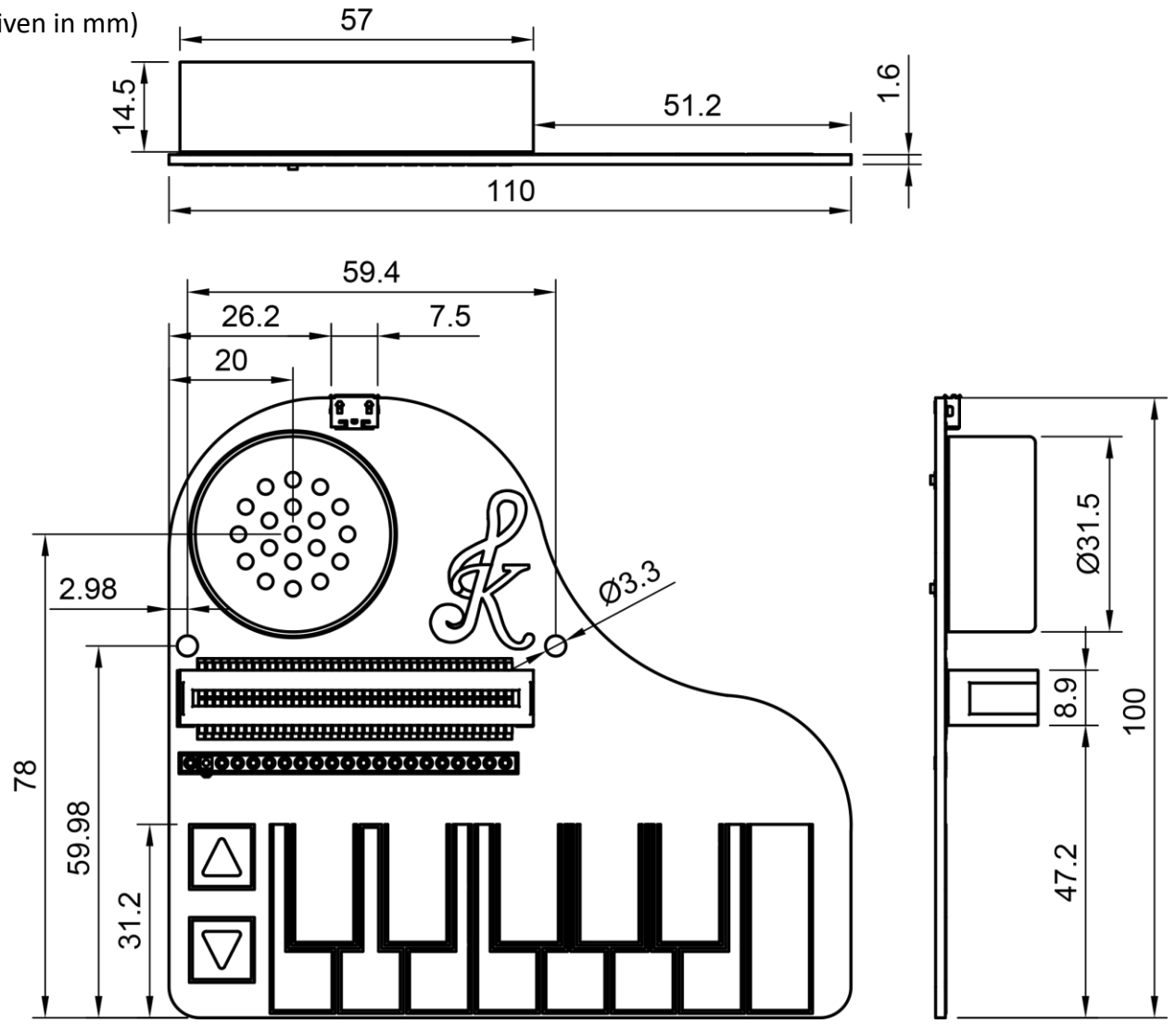
Board Dimensions:

(All measurements are given in mm)



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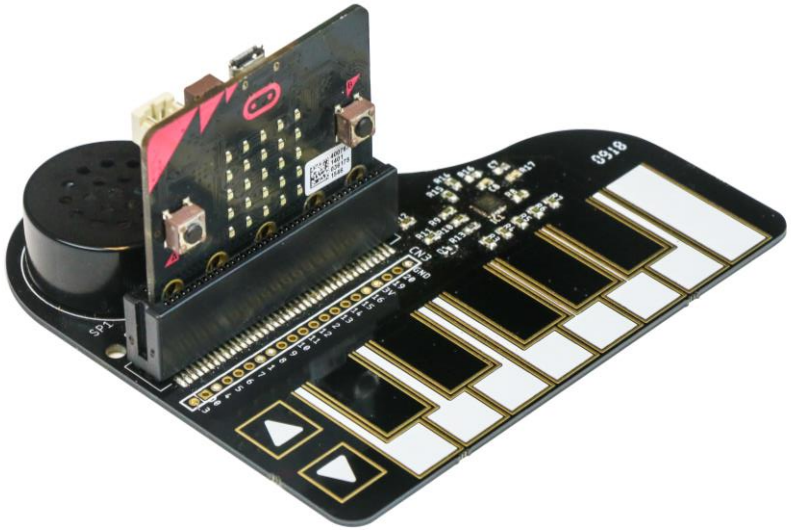
Electrical Information

Operating Voltage (5V micro USB Supply)	+5.0V
Regulated Voltage	+3.3V
Max Supply Current (Piano key press + micro:bit LEDs + Speaker Output)	350mA
External Connections (Link Header)	All BBC micro:bit Pins (IO Pins 5mA max sink/source current)
Power Supply via Link Header to External Devices	3.3V, 90mA max current draw

:KLEF Piano with BBC micro:bit inserted & rear view:



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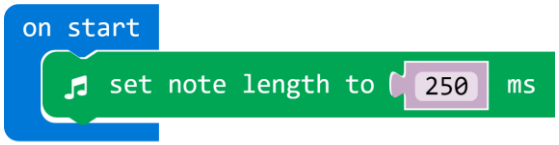
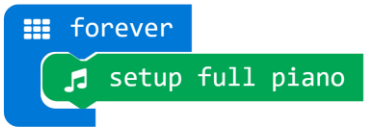
Microsoft MakeCode Blocks Editor Code

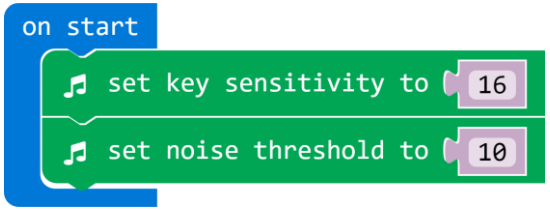
The program shown to the left was created using the Microsoft MakeCode Blocks Editor for the BBC micro:bit. It enables the piano to play different notes through the on board speaker, depending on which keys are pressed. The up/down function buttons currently just displays arrows on the BBC micro:bit display, but it could be setup to allow the octave to be shifted up and down, meaning many more notes as keys would be able to be played. The 'key…is pressed' produces a true or false value, depending on whether a particular key press is registered. This means the block can be used with the 'if…then' and 'while…do' MakeCode blocks.

The program shown below was also created using the Microsoft MakeCode Editor. This is a simple starter program which sets up the full piano in one block, but does allow the length of note played to be adjusted. **These blocks cannot be used with the 'key…is pressed' block.**





There are also blocks which enable some of the capacitive touch chip (AT42QT2160) settings to be changed.



Changing the key sensitivity alters how sensitive the touch keys are (the higher the sensitivity value, the greater the sensitivity).
Changing the noise threshold enables the touch sensor to cope with differing levels of background electrical noise (the higher the noise threshold value, the more electrical noise it can cope with).
Note: These programs use the Kitronik :KLEF Piano package available on Microsoft MakeCode (the green blocks shown here).